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ABSTRACT

This paper describes the effects two graduate level computer curriculum courses had upon participating teachers. One course examined instructional strategies involving computers which made for effective and practical lessons in language arts, social studies, science and mathematics. The other course introduced teachers to ways of using software in various elementary school curriculum areas. A questionniare submitted to the teachers sought to determine how the courses changed their attitudes about computer applications in the classroom, affected their self-confidence as a teacher, and the characteristic of the course that contributed most to their learning. Changes in teachers' attitudes were observed in their concepts about technology, their views of teaching, and their self-concept. These changes in the teachers' ways of relating to computer use are summarized, and strategies and elements in the courses which may have facilitated these changes are discussed. (JD)

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Expanding Teachers' Thinking in Computer Curriculum Courses

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Abstract

This paper describes the effects which two graduate level computer curriculum courses had upon teachers. The profound changes in the teachers' ways of relating to technology, their views of teaching, and their self-concepts are summarized. Strategies and elements in the courses which may have facilitated these changes are discussed.

Expanding Teachers' Thinking in Computer Curriculum Courses

As we worked on this paper one afternoon, a teacher walking by asked us about it. We told him the paper was on "Expanding Teachers' Thinking." "Good luck," he retorted, as though such "expanding" was practically impossible.

We were taken aback for a moment. But we understood his skepticism. After all, we too did not believe it when we first noticed these "expansions" among the teachers enrolled in two graduate level computer curriculum courses at Webster University.

One course was "Instructional Design for Computer Use," first taught in 1984. The aim of this course was to examine instructional strategies involving computers which made for effective and practical lessons in the language arts, social studies, science and math. The other course, titled "Software for the Elementary Curriculum," has been taught since the Summer 1986 semester. This course introduced teachers to ways of using software in various elementary school curriculum areas. Most participants in these courses were teachers pursuing advanced degrees at the University.

In content, both courses focused on the use of computers in the classroom. But in the end, the courses were only incidentally about computer use. The courses affected many teachers profoundly. Their concepts about technology changed. Their curriculum philosophy changed. And their self-concepts changed.

To validate our observations, we studied the teachers' comments on the course evaluations. We listened to their comments as the courses progressed. We watched to see if the same changes occurred in subsequent

courses. (The "Instructional Design" course was taught four times, and the "Software in the Elementary Curriculum" has been taught twice.) To document the changes, we administered an informal questionnaire which asked teachers whether they experienced these changes. The questionnaire included the following items: (a) In what ways (if any) has this course changed the way you think about computer applications in the classroom? (b) Do you feel that this course has affected your self-concept as a teacher? If so, please describe. (c) Please describe one or more characteristics of the course or the instructor which contributed most to your learning.

We should note that the changes did not affect everyone who took the course. Some teachers said they learned a lot in the course without changing in the ways we describe.

How Teachers Changed

The changes fell into three categories: (A) Changes in teachers' concepts about technology; (B) New ways of thinking about teaching; and (C) Self-concept changes.

A. Changes in teachers' concepts about technology.

Many teachers began the course seeing only one general approach to computers. A typical image was one student sitting at a computer doing an activity. By the end of the course, teachers knew other ways to involve students with computers such as small group, whole class, and the learning station format. Thus, when previewing software, the teachers were no longer limited to the format suggested by the software designers. For example, although Word Attack is designed for individual student use,

teachers also could describe how to use it in a small group format, and as a whole class activity.

Many teachers began the course assuming that each software had a single intructional purpose only. For example, Where in the World is Carmen Sandiego?, is a program designed to support almanac reference skills. Some teachers discarded the program because almanac reference skills were not in the curriculum for their grade level. But by asking whether the software could support other lesson topics, the teachers discovered that Carmen Sandiego could be as effective in supporting students' reference skills using the dictionary, or the encyclopedia, or the atlas.

Teachers saw how one activity could be used for different objectives. The Market Place, for example, may be used at grade 2 for developing group discussion skills, at grade 5 for developing inference and prediction skills, and at grade 7 for teaching marketing concepts.

Some teachers began the course with a view that computer courses form a separate curriculum. By the end of the course, many felt there was no need for separate computer courses since the computer applications could be included in the regular courses. Teachers no longer saw computers as a necessarily separate strand in the curriculum. Some teachers even saw the integration of computers into the regular curriculum. One teacher wrote that the course

> "opened my eyes to a lot of applications to which I had not previously been exposed. I feel the course has made me more aware of a variety of computer applications and has stimulated my interest in using the computer outside of computer programming classes."

Another teacher wrote:

> "I now know a variety of ways that software can be used in different subject areas. It has helped me to plan the integration of software into our curriculum. Prior to this the software was just used as drill and practice."

A common assumption about software was that it could be evaluated as "good" or "bad." By the end of the course, many teachers shifted away from evaluating software in global terms. They found creative ways of using software others thought were "poor". One teacher commented on the questionnaire that she discovered

> "many new uses of computers for students. I realize I can come up with my new ideas and try them with other teachers. I realize that there is good & bad software, but how I use it is the most important criteria."

In a similar vein, another teacher wrote:

> "I didn't see ways of using software in an integrated manner previously. Now I can look at a particular piece I might not have considered before and look for ways to use it."

In short, teachers' views of computer instructional strategies and educational software changed from limited, monotypic concepts to views of technology and software as expansive, multi-faceted and multi-purposed.

B. New ways of thinking about teaching.

Not only were teachers' concepts about technology affected. So were their concepts about teaching in general. Teachers became more aware of and reflective about their teaching strategies, even in topics where computers were not used. One teacher reported, "Yes, I feel that the knowledge from this course has made me more competent in my teaching."

They reported that they were evaluating their teaching more thoroughly, and searching for more effective or rewarding ways to teach.

They showed more interest in what other teachers were doing to see whether they might find ways to improve their own teaching.

Overall the teachers seemed to be more motivated in striving for excellence in their teaching.

The broadened scope of the teachers' own thinking also meant that their views of the curriculum and of students' learning were broadened. Their views of the limits of the curriculum and of students were challenged. They that they could take the students further than they previously believed. is rewarding for some teachers to review software and realize that they can teach skills previously thought too difficult. Sometimes the software makes this possible. Some software allows concepts to be taught at lower levels than they imagined possible. For example, with Bumble Games, second graders can understand and use the geometry concept of X-Y coordinates. Teachers realized that well-designed software linked with well-organized lessons enable students to achieve learning objectives which exceed those listed in their curriculum.

This curriculum extension also meant that the teachers were able to do lessons they would not have done before. For example, primary grade teachers who have never before done individual writing lessons felt capable of doing so when they became familiar with the ease of using Kid Writer.

C. Self-Concept Changes

Some of the changes among the teachers in the courses were affective. There was an elevation of self-confidence among some teachers, as indicated in the following comments:

> "I feel more confident about my teaching and myself overall. I'm not sure the way I teach will change too much, but I feel rejuvenated about my teaching. "

> "I feel more confident about knowing more things that I can do with the computer. Discussions and articles made me think (stimulated my thinking) about the advantages and disadvantages in using comptuers in the classroom."

Some teachers discovered new strengths in themselves. What was previously seen as a handicap, such as not being interested in programming, was overcome by the creative strengths they discovered in themselves.

> "I am 'afraid' of programming. This [course] helped me realize how useful the computer is even without time-consuming program writing."

> "I realize that possibilites are tremendous - creativity is something that should be used extensively. Too much of the 'same thing' defeats the power of the computer."

Teachers' enthusiasm increased. For some teachers, this meant a renewed excitement about personal and professional development.

> "It has added to my excitement about computers & exposed me to areas/ideas I had never considered."

> "I thought I would get burned out in teaching, but now I'm excited about teaching again, thanks to what computers help me do in the classroom."

> "...The Confidence I have gained with the computer has helped me to feel 'on top' of my lessons in a new way."

For some teachers, the courses provided a new mastery over anxieties. These anxieties include feeling insecure about their abilities to use computers and fears about damaging the machine. These fears can be almost paralyzing. The hours of guided hands-on experience, particularly in the "Software for the Elementary School Curriculum" course, enabled teachers with high initial anxieties about computers to lower those anxieties. One teacher reported:

> "Me and machines just don't get along. I'm still uncomfortable around any machine, but I learned how to talk to myself so I don't lose control when something goes wrong."

Another teacher wrote:

"I was one of those timid souls very afraid of using the computer. Now I am much more at ease and enthusiastic about using new programs. My fear is gone!"

Discussion

The significance of the changes we observed was that they occurred only in the two computer curriculum courses. The changes did not happen in other courses we teach. (These courses included computer programming courses, other computer applications courses (such as word processing), and other graduate education courses like "child development" and "contemporary issues in education.") As far as we knew, the changes did not occur in any other graduate education courses at the University either. What makes these two courses unique? Although we do not have a reliable way to link the changes to characteristics of the courses, it may be worthwhile discussing their common features.

In both courses, modeling was used repeatedly. Modeling involved the participants role-playing pupils in an elementary or secondary school classroom. The instructor conducted a given activity in the same manner as it would be done in a class of pupils. For example, the Kid Writer word processor was modeled with the teachers doing a "group story" activity, in the same way it would have been done with second graders. After the model lesson, the teachers discussed their experience in the lesson, the lesson strategy, and other ways of using the software.

Another strategy used in both courses can be called "making unexpected connections." In this process, teachers are directed to make new links between software and instructional strategy. For example, when studying computer tutorials, we asked, "How can the computer concept (in this case

tutorials) be used in teaching a lesson such as "Civil War." Teachers first thought of commonplace applications such as building a tutorial on "heroes of the Civil War", or finding one that already exists. But when other possible connections were explored, fresh ideas arose. For example, instead of the teachers making the tutorial, why not have students create the tutorials? Each student group could take one Civil War hero, conduct the research and compose the screens and questions. Later, other students in the class can do the tutorial and answer the questions.

Tutorials are ordinarily viewed as a teacher's tool to make student materials. But we made the unexpected connection of turning the teachers' utility into a student learning activity. This concept can be extended into other lessons since "tutorials" can be used in various content areas. Other teacher utilities can also be turned into student activities. For example, Crossword Magic is intended for teachers to create crossword puzzles. But instead of the teacher making the puzzles for students to solve, the pupils could create the puzzles.

Modeling and making unexpected connections were two strategies which seem to have stimulated the changes described. In both strategies, the teachers saw teaching concepts from unusual perspectives. In modeling, they experienced the "pupil-eye view" of a lesson. In "unexpected connections," they were forced to make creative links when creative thinking felt foreign to them. The teachers' growth seemed to become real through repeated experiences like these, which encouraged them to think in unfamiliar ways about familiar teaching ideas.

Perhaps more important than particular strategies in the course were the instructors' basic assumptions about the teachability of teachers.

Several teachers noted that the instructors held high expectations of the participants, and continuously believed in the abilities of the teachers to adequately master the technology and to discover their own creative powers. This belief probably helped establish a classroom atmosphere which was conducive to the profound growth we observed.

Conclusion

The most noteworthy changes which occurred in the two computer curriculum courses involved teachers' personal and professional growth. We saw a genuine expansion of thinking and of selves among the teachers. It was most rewarding and gratifying to see teachers grow in these ways. This was the "teacher renewal" so often hoped for in inservice courses and programs. We would like to see this happen elsewhere. But since we only got a glimpse of this process, more observation of this growth in other courses and workshops is needed. After we understand these growth processes more fully, we may be able to design learning experiences which can systematically promote new possibilities for growth among teachers.

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